Guiding Vector Field Implementation and Error Correction Analysis

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Robots that require smooth, precise, and robust movement along flat ground have become ubiquitous: warehouse operations, competitive robotics, and assistive robots in human spaces like offices or homes. There are a wide variety of algorithms use for path following, but many commonly used ones suffer from inherent lack of robustness and precision. Additionally, path following algorithms tend to suffer from needing to be tuned to their specific robot and environment, which can be a lengthy process. This investigation is two-pronged: first, a relatively recent algorithm called a guiding vector field (GVF) intended to solve these problems is implemented from scratch and tested on a real life holonomic robot. Second, the error vector weight is changed to analyze how much of an effect tuning actually has when the robot is given a disturbance. Quantifying how precise the tuning must be before reaching diminishing returns is highly helpful in quickly getting a robot working in a new environment. The GVF worked as intended and experimental results indicated that precision tuning of the error vector weight would not be necessary for the majority of cases and that one would quickly reach diminishing returns.

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